EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	7175	slope with sample	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:03
L2	28970	kaiser	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:03
L3	62	1 and 2	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:09
L4	20974	path adj1 select$3	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:59
L5	59	1 and 4	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:43
L6	2	2 and 5	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 09:59
L7	1681528	curv$3 or slop$3	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:04
L8	49975	sample with 7	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:04
L9	0	"375"/.$.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:43
L10	68708	"375"/$.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:43
L11	0	8 and 9	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:43

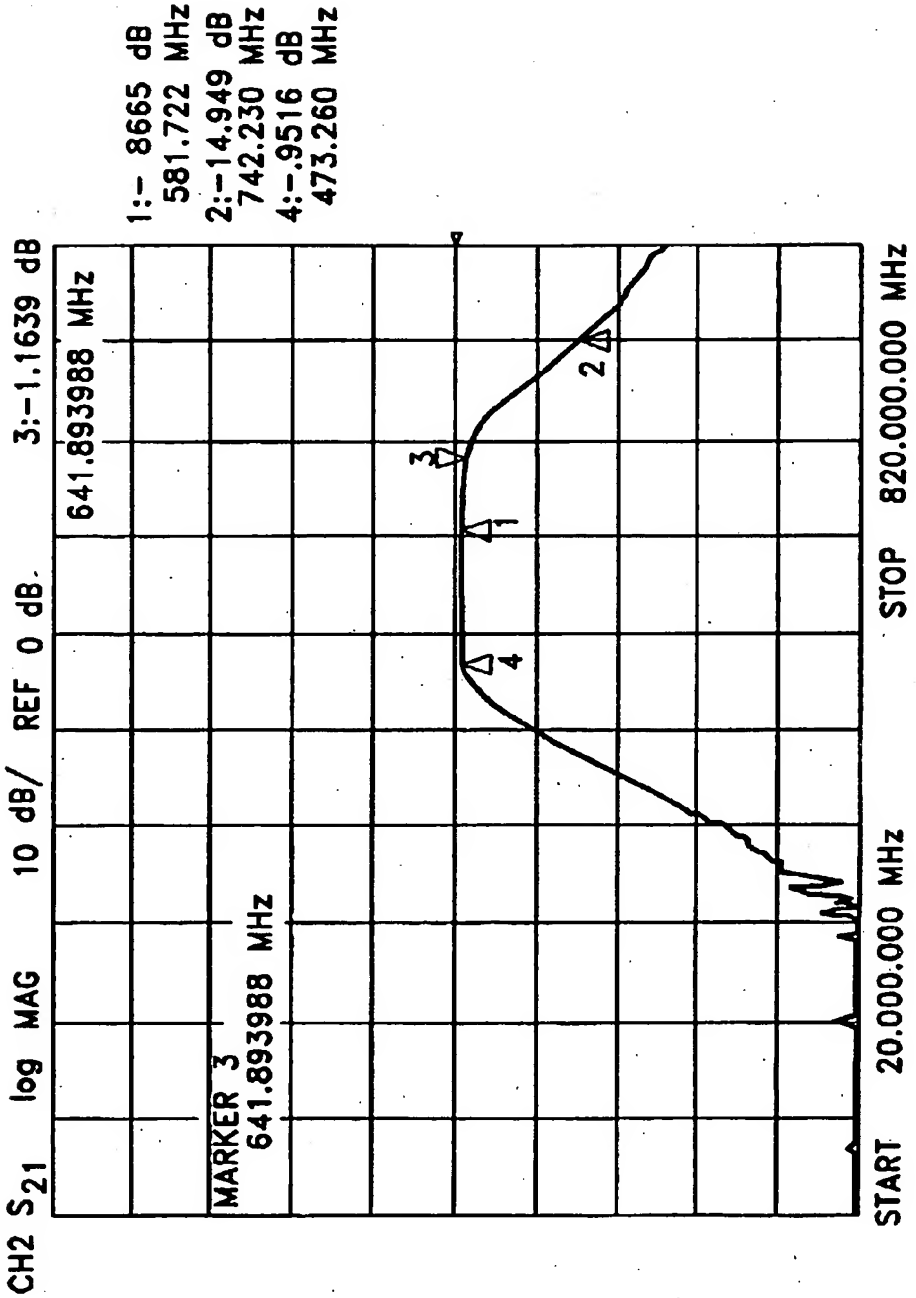
1:- 8665 dB
581.722 MHz
2:-14.949 dB
742.230 MHz
4:-.9516 dB
473.260 MHz
3:-1.1639 dB
641.893988 MHz
CH2 S21 log MAG 10 dB/ REF 0 dB
MARKER 3
641.893988 MHz
START 20.000.000 MHz
STOP 820.000.000 MHz

FIG. 15

EAST Search History

L12	561	8 and 10	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:44
L13	460	12 and (@ad<="20030630")	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:07
L14	429565	gps	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 10:46
L15	19	13 and 14	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:05
L16	537255	amplitude	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:05
L17	291	1 with 16	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:06
L18	0	14 and 17	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:06
L19	15011	up adj2 sampl$3	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:06
L20	163	19 same 8	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:07
L21	122	20 and (@ad<="20030630")	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:11
L22	1	21 and 14	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 11:07
L23	2	"7095813".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 12:43

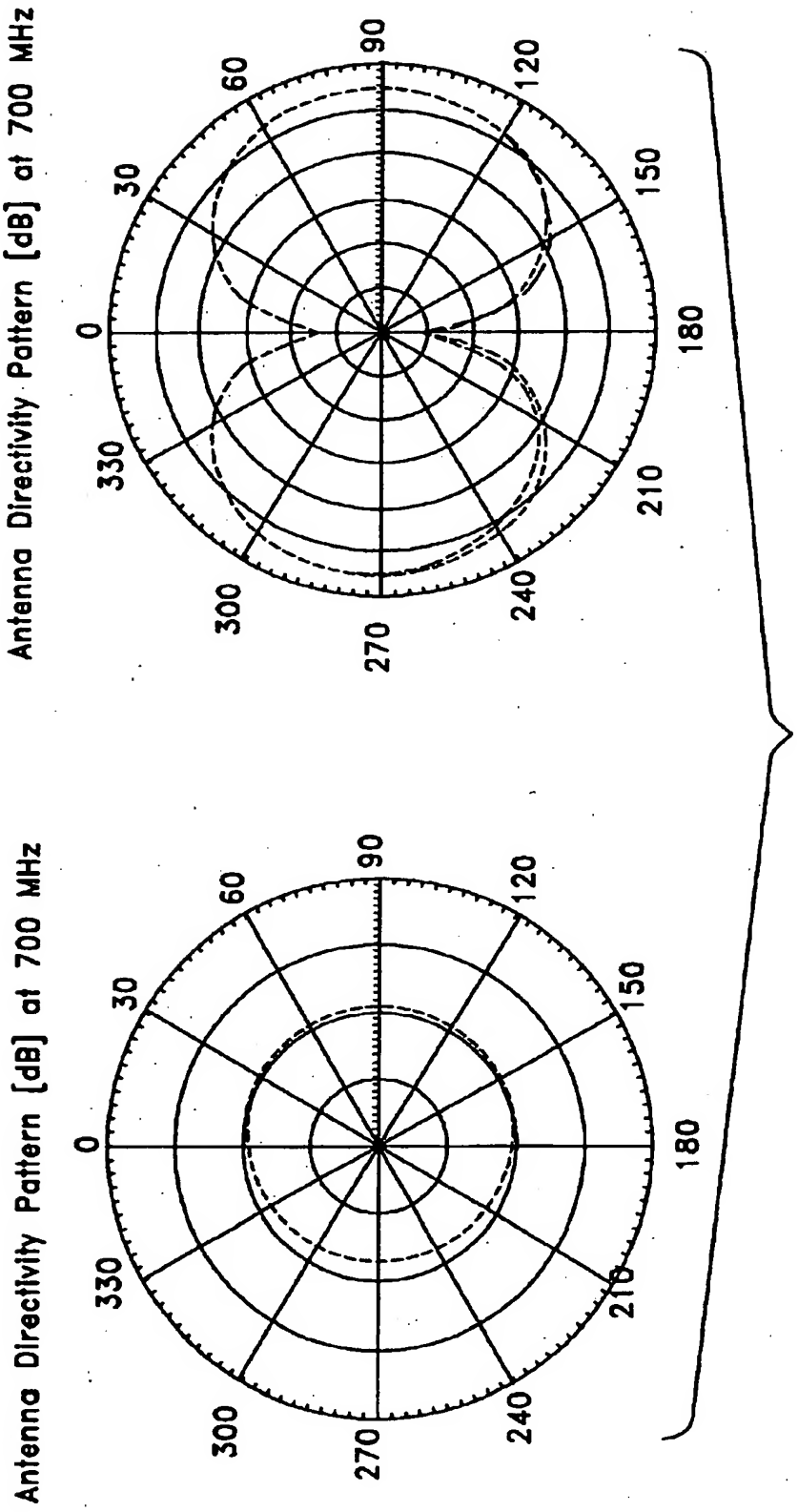
Antenna Directivity Pattern [dB] at 700 MHz
90
60
30
0
330
300
270
240
210
180
150
120
Antenna Directivity Pattern [dB] at 700 MHz
90
60
30
0
330
300
270
240
210
180
150
120

FIG. 16

EAST Search History

L24	4474	path adj2 search$3	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 12:44
L25	7	1 and 24	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 12:44
L26	3	14 and 25	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2007/04/19 12:44

RADIO FREQUENCY DEVICE FOR RECEIVING TV SIGNALS AND GPS SATELLITE SIGNALS AND PERFORMING POSITIONING

RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/361,762, "DTV Position Location Augmented by GPS," by James J. Spilker, filed Mar. 4, 2002; U.S. Provisional Patent Application Ser. No. 60/341,922, "An Inexpensive Hardware and Signal Processing Technique for Tracking Television Signals in a Mobile Handheld Device," by Matthew Rabinowitz, filed on Dec. 18, 2001; U.S. Provisional Patent Application Ser. No. 60/353,440, "DTV Position Location Augmented by GPS," by James J. Spilker, filed Feb. 1, 2002; U.S. Provisional Patent Application Ser. No. 60/332,504 "DTV Augmented GPS for Robust Aircraft Navigation," by James J. Spilker, filed Nov. 13, 2001, the disclosures thereof are incorporated by reference herein in their entirety.

This application is related to U.S. Non-provisional Patent Application Ser. No. 10/003,128, "Robust Data Transmission Using Broadcast Digital Television Signals," by James K. Omura, James J. Spilker, Jr. and Matthew Rabinowitz, filed Nov. 14, 2001; U.S. Non-provisional Patent Application Ser. No. 09/887,158, "Position Location using Broadcast Digital Television Signals," by James J. Spilker and Matthew Rabinowitz, filed Jun. 21, 2001; U.S. Non-provisional Patent Application Ser. No. 09/932,010, "Position Location using Terrestrial Digital Video Broadcast Television Signals," by James J. Spilker and Matthew Rabinowitz, filed Aug. 17, 2001; U.S. Non-provisional Patent Applications Ser. No. 10/054,302, "Position Location using Broadcast Analog Television Signals," by James J. Spilker and Matthew Rabinowitz, filed Jan. 22, 2002; U.S. Non-provisional Patent Applications Ser. No. 10/353,669, "Position Location Using Ghost Canceling Reference Television Signals," by James J. Spilker and Matthew Rabinowitz, filed (TBS); and U.S. Non-provisional Patent Application Ser. No. 10/054,262, "Time-Gated Delay Lock Loop Tracking Of Digital Television Signals," by James J. Spilker and Matthew Rabinowitz, filed Jan. 22, 2002; U.S. patent application Ser. No. 10/159,478, "Position Location using Global Positioning Signals Augmented by Broadcast Television Signals," by Matthew Rabinowitz and James J. Spilker, filed May 31, 2002; and U.S. Non-provisional Patent Applications Ser. No. 10/290,984, "Position Location using Integrated Services Digital Broadcasting-Terrestrial (ISDB-T) Broadcast Television Signals," by James J. Spilker and Matthew Rabinowitz, filed (TBS), the disclosures thereof are incorporated by reference herein in their entirety.

INCORPORATION BY REFERENCE

This application hereby incorporates by reference in its entirety the following documents: 1) B. W. Parkinson and J. Spilker, Jr., Global Positioning System-Theory and Application, Volumes I & II, AIAA, Washington, D.C. 1996, and 2) J. Spilker, Jr., Digital Communications by Satellite, Prentice-Hall, Englewood Cliffs, N.J., 1977, 1995.

FIELD OF THE INVENTION

The present invention relates generally to position determination and data reception, specifically to a radio frequency device that enables reception of television and/or GPS signals for position determination and data reception.

BACKGROUND INFORMATION

There exist methods for two-dimensional latitude/longitude position location systems using radio signals. In use are terrestrial systems such as Loran C and Omega and satellite-based systems such as the Transit system and Global Positioning System (GPS).

Initially devised in 1974, GPS is widely used for position location, navigation, surveying, and time transfer. The GPS system is based on a constellation of 24 on-orbit satellites in sub-synchronous 12 hour circular, inclined orbits. Each satellite carries a precision atomic clocks and transmits a pseudo-noise signal, which can be precisely tracked to determine pseudo-range. By tracking 4 or more satellites, one can determine precise position in three dimensions in real time, world-wide. More details are provided in B. W. Parkinson and J. J. Spilker, Jr., Global Positioning System-Theory and Applications, Volumes I and II, AIAA, Washington, D.C. 1996.

GPS has revolutionized the technology of navigation and position location. However in some situations, the effectiveness of GPS is limited because the GPS signals are transmitted at relatively low power levels (less than 100 watts) and over great distances, the received signal strength is relatively weak (on the order of −160 dBW as received by an omni-directional antenna). Thus the signal is marginally useful or not useful at all in the presence of line-of-sight blockage or while the receiver is inside a building.

In recent years, there has been a rollout of digital television in Asia, Europe and the Americas. Some of the primary standards around the world are ATSC (e.g. United States), DVB (e.g. Europe) and ISDB (e.g. Japan). As of February 2001, approximately 1200 DTV construction permits for US DTV stations had been acted on by the FCC. Over 1600 DTV transmitters are expected in the United States. Other regions are implementing similar DTV systems. The Japan Broadcasting Corp. (NHK) has defined a terrestrial DTV signal for Japan, referred to herein as the Integrated Services Digital Broadcasting-Terrestrial (ISDB-T) signal. These new DTV signals permit multiple TV signals to be transmitted in the assigned 6 MHz radio channel. All of these different television standards employ an embedded synchronization code which is used to probe the transmission channel and mitigate the effects of multipath in a digital TV receiver. In order to be effective for channel modeling and multipath mitigation, these synchronization codes have wide bandwidths, narrow time autocorrelation functions, and high power levels. The above-stated features make the synchronization codes ideal for positioning, in particular indoors where multipath effects are severe and GPS signals may not penetrate. In addition, analog television broadcasts have also started in recent years to insert into their broadcasts a synchronization code termed the Ghost-Canceling Reference (GCR), which is used for multipath mitigation on analog signals in TV receivers that digitize the signal. Consequently, the GCR can also be used for precise ranging. Other test signals inserted in the analog broadcasts, such as the multiburst signal, may also be used for position determination.

There is a proposed system for using conventional analog National Television System Committee (NTSC) television signals to determine position. This proposal is found in a U.S. Patent entitled "Location Determination System And Method Using Television Broadcast Signals," U.S. Pat. No. 5,510,801, issued Apr. 23, 1996. However, the technique described the use of the horizontal and vertical synchronization pulses which were intended only for relatively crude